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May 23, 1959

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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE

Fair Winners

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A SCIENCE SERVICE PUBLICATION

GENERAL SCIENCE

Secrecy Hampers Research

A scientist has charged that Federal Governmental secrecy policies are seriously affecting space research and scientific fields, sometimes making communications impossible.

SPACE research and all other fields of scientific study are hampered by the Government's secrecy policies, a University of Maryland physics professor has charged.

Dr. Fred Singer told the House Space Committee of his unsuccessful attempts to obtain information on the Russian moon shot, Mechta, which was launched into an orbit around the sun January, 1958. He said he tried several times in various ways to learn what U. S. Government agencies had learned from the Russian moon shot.

When these efforts proved fruitless, Dr. Singer reported, he obtained the desired information from translated Russian sources. He blamed a tendency on the part of personnel in both military and civilian Government agencies "to sit on data," since the requested information was not under secrecy wraps.

However, Dr. Singer said, the problems of obtaining information are "much broader than space research," and affect all scientists connected with the Federal Government's research programs. Even though he has clearances from more than one agency, including the Atomic Energy Commission, Dr. Singer said he had to establish his "need to know" before the information could be given him.

Dr. Singer charged the "need to know" was a device used to keep persons from finding out the information was available at all. It is difficult, Dr. Singer pointed out, to establish a need to know when you do not know that another person has the desired information.

A recent example of this in Dr. Singer's field of rocket and space research was the Argus experiment in which atomic bombs were exploded high above the Atlantic Ocean late last summer and the resulting radiation trapped in space was measured. Dr. N. C. Christofilos of the University of California, who suggested the explosions, and Dr. Singer could not discuss the theory of such trapped radiation for several months, even though Dr. Singer had suggested the existence of trapped radiation high above the earth's surface some three years ago, because the experiments were not disclosed until March.

Science News Letter, May 23, 1959

ENGINEERING

Nuclear-Powered Blimp

AMERICA'S FIRST nuclear-powered aircraft could very well be a huge blimp, about three times the size of those now being used by the U. S. Navy for submarine and plane spotting.

The Navy has been informed of the feasibility of a nuclear powered non-rigid airship, which could be operational by 1963, the Goodyear Tire and Rubber Company reported. The Goodyear representatives spoke at an Aviation Writers Association meeting in Washington.

The blimp would be made of a new rubberized fabric capable of withstanding radiation exposures up to 100,000,000 roentgens. The fabric is made of Dacron cloth, coated with synthetic rubber.

A nuclear-powered blimp could be fitted with a reactor with only one-twentieth the power needed to sustain a nuclear-powered plane. Calculated radiation levels for such a small reactor are of such low order that no elaborate ground handling equipment or special crew environment need be provided, Goodyear officials said.

Capable of 70- to 80-knot speeds, the proposed 4,500,000 cubic-foot airship could reach any point in the world from existing United States bases. Its operational altitude would be 10,000 feet.

The blimp's length would be 540 feet, making it possible to locate the atomic reactor far enough away from the craft's control car to permit personnel to work in an environment comparable to that of an atomic plant. The design calls for the reactor to be placed amidship, with the control car near the bow.

The control car would be 86 feet in length, have two decks, and be able to accommodate 24 officers and men. State-room type crew quarters would be relatively free of vibration and noise.

Security requirements, the officials said, prevent disclosure of the airship's detail and the extent of its shielding. They did report suggesting, however, that chemical fuel could be used for takeoff and landing, with the reactor shut down during these times. Once airborne, the blimp's turboprop engines would be nuclear-powered.

Science News Letter, May 23, 1959

BACTERIOLOGY

Invading Virus Transfers Bacterial Drug Resistance

VIRUSES attacking bacteria may be indirectly responsible for making "staph" bacteria resistant to drugs.

The invading virus apparently picks up the heredity material of a drug-resistant bacterium and then transfers it to one that is drug-sensitive, Dr. M. L. Morse of the University of Colorado Medical Center, Denver, said.

In studies reported to the Society of American Bacteriologists meeting in St. Louis, Mo., Dr. Morse explained that a bacterial virus transferred resistance to the antibiotics streptomycin and novobiocin from one staph cell to another. First the viruses were grown on resistant staph cells. Then they were allowed to invade drug-sensitive cells. Approximately one cell in 10,000,000 of the cells that survived the virus infection became resistant to the antibiotics.

Previously, Dr. Morse reported, other cases of virus infection alone had failed to produce any resistant cells. Therefore, it must have been the transfer of hereditary drug resistance from one staph cell to another that accounted for the new antibiotic resistance, he concluded.

It will be necessary to evaluate the transferring process to discover if it contributed to the occurrence of multiple drug-resistant strains in hospitals, Dr. Morse said. The transfer can produce strains resistant to more than one drug by combining the resistance properties of two different strains.

Staphylococci are currently a source of many hospital-acquired infections.

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BACTERIOLOGY

Bacteria Are "Refined" For Radiation-Resistance

BACTERIA which are resistant to radiation are attracted by a negative electrical charge, reported Dr. Harold L. Sadoff, assistant professor of microbiology, and John H. Green, graduate student, both of Michigan State University.

Normal bacteria, they also found, are attracted by a positive charge.

These findings, Dr. Sadoff told scientists at the Society of American Bacteriologists meeting in St. Louis, Mo., may help science arrive at a better understanding of how radiation kills all living things.

They may also help to solve some problems of preserving food by sterilizing it with radiation, he added.

Dr. Sadoff and his assistant isolated *Streptococcus faecalis*, a fairly common strain of bacteria, from food which had been subjected to 2,000,000 roentgens. This is five to ten times the dose needed to kill a normal culture of the bacteria.

When these bacteria reproduced 99% of the offspring were normal in resistance. Only one percent was exceedingly resistant.

Using a technique called electrophoresis, the MSU scientists observed some bacteria gravitated toward a negatively charged pole. When members of this group were exposed to radiation ten percent survived a high dose. When the group was further refined by electrophoresis, 36% survived the maximum dose that was given.

"By combining electrophoresis with other techniques," Dr. Sadoff said, "we should be able to determine the basis of radiation resistance in this organism."

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PHYSICS

Shock Wave Created

High velocity shock waves, produced in nature by solar flares, have been duplicated for the first time in the laboratory, thus confirming a theory on the origin of magnetic storms.

SCIENTISTS have duplicated for the first time space shock waves that move at more than a million miles an hour from the sun to earth.

The laboratory-produced waves confirm a theory advanced six years ago by Prof. Thomas Gold, then chief assistant to the Astronomer Royal in Great Britain, and now at Harvard University.

Creation of the high-velocity waves was achieved at the Avco-Everett Research Laboratory, Everett, Mass., under the guidance of Dr. Arthur Kantrowitz, the Laboratory's director.

Shock tubes like that in which the waves were produced are being considered as a potential thrust device for space vehicles. The Avco shock tube produces such high temperatures with such a relatively small expenditure of power that it may be used in nuclear fusion research, the attempt to harness peacefully the power of the hydrogen bomb.

Prof. Gold told SCIENCE SERVICE that in nature the shock waves are produced by solar flares. During flares great "blobs" of ionized gas are ejected from the sun. They sometimes race toward the earth at up to two million miles an hour, preceded by a thin sharp wave front.

A front and the gas blob behind it compress the earth's magnetic field, and the gas feeds the Van Allen radiation belts. The ionized gas particles are captured in the belts, temporarily producing a tremendous increase in radiation. Such an increase, about 20-fold, was first detected by the Pioneer IV lunar probe a few days after a series of flares appeared on the sun.

The intense radiation in the Van Allen belts is believed a possible hazard to future space travelers. Now it is known that astronauts will have to dodge the highly charged gas balls thrown out from time to time by the sun.

Research leading to the achievement of the laboratory shock wave began in 1953 when Dr. Kantrowitz delivered a lecture in Cambridge, England, on the "dynamics of cosmical gas clouds." At the conclusion, Prof. Gold suggested that the existence of a shock wave would explain a long-puzzling phenomenon: the sudden commencement of magnetic storms simultaneously all over the earth. (Such storms disrupt radio communications.)

However, shock waves as then known involved collisions between molecules, and there were not enough molecules between the sun and the earth to transmit them. That is, a shock wave could only be propagated in a thick atmosphere in which molecules of gas bounced one against the next like billiard balls in a row.

This suggested a new shock propagating mechanism, perhaps involving magnetic fields, which allowed the formation of a previously unknown kind of shock wave in the extremely rarefied gases of interplanetary space. Using the analogous billiard balls again, if they were hundreds of feet apart it would be impossible to produce the same shock effect obtained when they are lined up one against the next. But, if they were surrounded by powerful magnetic fields, one ball could push another without ever touching it.

Somewhat later, Dr. Richard Patrick of the Avco-Everett Laboratory developed the electric shock tube that first demonstrated this new kind of space shock wave. Dr. Patrick told SCIENCE SERVICE the tube works in this way:

A rarefied mass of hydrogen gas at room temperature is contained in the 30-inch-long tube. The gas is tightly confined by a magnetic field on all sides but one. A four-billion-watt electrical impulse lasting two-millionths of a second is discharged into the tube. The gas temperature is suddenly raised to one-and-a-half million degrees and the hydrogeen is completely ionized (meaning the hydrogen atoms are stripped of their electrons). In this split second, the hydrogen ions are shoved a million miles an hour and a sharply defined shock wave front is produced by collisions of the ions' magnetic fields.

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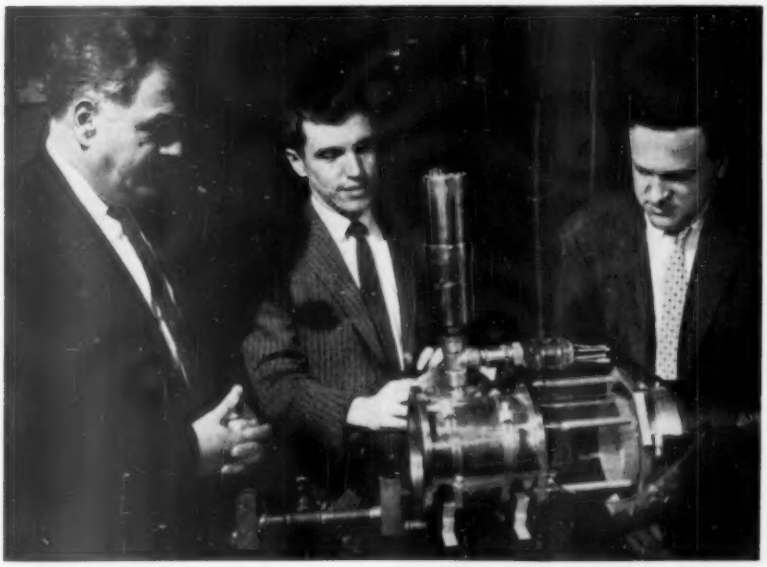

ELECTRIC SHOCK TUBE—Drs. Arthur Kantrowitz and Richard Patrick of the Avco-Everett Research Laboratory and Prof. Thomas Gold of Harvard University (left to right) are shown with the electric shock tube in which interplanetary shock waves have been reproduced and speeds exceeding 1,000,000 miles per hour obtained.

CYTOLOGY

Cell's RNA Comes From Its Nucleus

THE CELL'S nucleus is pretty poor so far as its ribonucleic acid content goes.

However, studies of a mold indicate that all the cell's ribonucleic acid, or RNA, is formed in the nucleus and then migrates into the cell protoplasm later, Dr. M. Zalokar of Yale University's department of microbiology reports.

The mold was fed hydrogen-3 labelled uridine, an important constituent of RNA, and then centrifuged. When the hyphae then took their own pictures through the technique of autoradiographs, it was possible to trace the amount of RNA in various cell parts.

Most of the cellular RNA is in the microsomes, the so-called protein factories of the cell. Some is in the mitachondria, while none is detectable in remaining cytoplasm, fat, glycogen or cell vacuoles. The mitachondria contain enzymes used in the cell's oxidation of food.

"These findings suggest that ribonucleic acid is a direct product of gene action," Dr. Zalokar says. "Ribonucleic acid is formed in nuclei, the seat of chromosomes and genes; it migrates into the cytoplasm; and it is required for the synthesis of proteins."

Further details of the research with the mold *Neurospora crassa* appear in *Nature* (May 9).

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GENERAL SCIENCE

Encouragement in Science

Facts and figures about the 320 finalists in the tenth National Science Fair indicate the boys and girls became interested in science very early in their school years.

DATA ON the 320 finalists at this year's National Science Fair re-emphasizes the importance of providing opportunities to discover the exciting possibilities of science during the elementary grades and junior high school.

According to a report released by SCIENCE SERVICE, which conducts the Fair through its Science Clubs of America, 56% of these 227 boys and 93 girls were interested in science by the time they were 10½ years old. Another 26% became science-minded during the junior high school years of 7th, 8th and 9th grade. Nearly half of this junior high enthusiasm bloomed among 13-year-olds, or the 7th grade level.

Teachers at nearly every grade level, science courses, laboratory experiences, demonstrations, and appealingly written textbooks captured the initial interest of 30% of these students. The influence of parents and other family members and the atmosphere of their homes were credited for their enthusiasm by 21%. Others mentioned such catalysts as their own curiosity and drive, scientific equipment, reading material, science clubs and fairs, scientists and summer jobs in science, educational films and television programs, etc.

Asked to describe the source of the ideas that inspired the outstanding projects that won these high school sophomores, juniors, and seniors the privilege of competing at the national level, 35% said they found their ideas in magazines, journals, books, research papers and news stories. Personal experiences, observations, hobbies, experiments, and individual study yielded interesting project subjects for 28%. About 14% found stimulating questions at school and 11% at science fairs, Junior Academy of Science and science club meetings, from scientists and scientific laboratories.

Nearly all, 97.5%, of these young people are looking forward to careers in a great variety of scientific specialties, with about 21% planning work in the medical sciences, 19% in engineering and electronics, 15% in the biological sciences, 13% in physics, 7.5% in teaching (many more include teaching as part of their futures), about 6% in chemistry, and so forth.

Almost 56% of the fathers of the finalists continued their education beyond high school, earning 37 BS degrees, 13 BA's, 11 MS's, eight MA's, nine MD's, 16 LlB's, 17 PhD's, one DSc, one DrIng, etc.

More than 51% of their mothers attended college, earning eight RN degrees, 31 BS's, 40 BA's, six MA's, three MS's, one MD, one LlB, etc. About 30% of the mothers are employed.

More than a hundred different periodicals, both general science magazines, such as SCIENCE NEWS LETTER, and highly specialized journals, were named by the finalists in answer to a question concerning the scientific publications which they regularly read. Only 31 of the students do not consistently read one or several such publications.

About a fourth of these potential scientists have scientists in their family backgrounds, either in their immediate families or among their relatives. Alexander Graham Bell was the great-grandfather of one finalist and Sir Arthur S. Eddington, famous English astronomer, was the cousin of another.

It is estimated that more than 45,000 students and adults visited the Tenth Annual National Science Fair in Hartford, May 6 to 9, to study the projects exhibited by the 320 finalists representing 168 areas, regional, state, and nation-wide fairs in the United States, Japan, Germany, Canada and Puerto Rico. It is believed that well over 600,000 projects were shown in the local and school fairs that preceded the larger fairs affiliated with the National Science Fair.

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KAREN LEE GABBARD—A top winner in biology with her studies of a mold.

SCIENCE NEWS LETTER
VOL. 75 MAY 23, 1959 NO. 21

Edited by WATSON DAVIS

The Weekly Summary of Current Science, published every Saturday by SCIENCE SERVICE, Inc., 1719 N St., N.W., Washington 6, D. C., NOrth 7-2255. Cable Address: SCIENSERVC.

Subscription rates: 1 yr., $5.50; 2 yrs., $10.00; 3 yrs., $14.50; ten or more copies in one package to one address, 7½ cents per copy per week; single copy, 15 cents, more than six months old, 25 cents. No charge for foreign postage.

Change of address: Three weeks notice is required. When ordering a change please state exactly how magazine is now addressed. Your new address should include postal zone number if you have one.

Printed in U.S.A. Second class postage paid at Washington, D. C. Established in mimeograph form March 13, 1922. Title registered as trademark, U. S. and Canadian Patent Offices. Indexed in Reader's Guide to Periodical Literature, Abridged Guide, and the Engineering Index. Member Audit Bureau of Circulation.

SCIENCE SERVICE

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GENERAL SCIENCE

Science Fair Winners

Six scientists, three boys and three girls because of two ties for honors in both the biological and physical sciences, were chosen top winners in the tenth National Science Fair.

See Front Cover

SIX TEEN-AGED scientists have been awarded top honors at the National Science Fair. A platoon of more than 100 judges, after viewing about 300 scientific exhibits developed by the finalists, awarded three top honors each for biological and physical exhibits.

In the biological class, the three top winners were: Karen Lee Gabbard, 18, of Terre Haute, Ind., for her study of a mold that was found to produce an antibiotic; Eric Vollrath, 17, of San Marino, Calif., for photographic studies and research on protozoa; and Robert R. Dickey, 16, Fort Worth, Texas, for experiments with embryos.

Three top winners in the physical science competition went to: Gwenda Dowden, 15, of Florien, La., for her comparison of synthetic and natural dyes; Patricia Van de Vyver, 17, Detroit, Mich., who extracted and separated pigments in plant leaves; and Joie Pierce Jones, 18, Abilene, Texas, who designed a complete rocket that climbed 50 miles and sent back cosmic-ray data.

All six top winners appear on the cover of this week's SCIENCE NEWS LETTER. They are (top row, left to right): Karen Lee Gabbard, Joie Pierce Jones, Patricia Van de Vyver, and (bottom row, left to right), Eric Vollrath, Gwenda Dowden, and Robert R. Dickey.

Each of these top winners can request $125 in equipment, apparatus and publications designed to further his scientific career.

The National Science Fair is conducted by SCIENCE SERVICE through its Science Clubs of America. Its goal is to interest America's youth in science careers. The activity has spread to other countries, and finalists this year came from as far away as Alaska, Hawaii, Canada, Puerto Rico, Germany and Japan.

More Award Winners

Second place awards of $75 in "wish" equipment were made to: Janice Ann Picchioni, 18, Roundup, Mont.; Elaine Joy Baskin, 15, Yonkers, N. Y.; Anne Haley Nash, 15, Tulsa, Okla.; Robert Curtis Anderson, 17, Glendale, Calif.; Alan H. Chaiet, 15, Springfield, N. J.; Robert Clinton Bast Jr., 15, Arlington, Va.

Also, Dale A. Anno, 17, Topeka, Kans.; Rosemarie Ann Leandri, 17, Luzerne, Pa.; David Paul Eartly, 17, Hammond, Ind.; David Stephen Ecklein, 18, Cedar Falls, Iowa; and Jon Denis Canaday, 18, Pauls Valley, Okla.

Third Place Awards and $50 Wishes go to: Eddie C. Stone, 16, Heidelberg American H. S., Heidelberg, Germany; Kathleen Bauernfeind, 18, Butler H. S., Butler, N. J.; Barbara L. Neal, 16, Central H. S., Knoxville, Tenn.; Masayuki Takahashi, 16, Hamamatsu Kita H. S., Hamamatsu, Japan; Richard Serwin, 17, Pontiac Central H. S., Pontiac, Mich.; Richard P. Bentley, 16, Tupper Lake H. S., Tupper Lake, N. Y.; L. Thomas Oxley Jr., 18, Charleston Catholic H. S., Charleston, W. Va.; Janice M. Reeder, 17, Puyallup H. S., Puyallup, Wash.; Richard D. Copaken, 17, Paseo H. S., Kansas City, Mo.; and Blair D. Savage, 17, White Plains H. S., White Plains, N. Y.

Fourth Awards of $25 Wishes will be given to:

From Alabama — Michael Carpenter; Alaska—Jack Griffith; Arizona—William Max Ivey; Arkansas—John Sullins; California—Leslie Naman, Carol Solodyna, Daniel Cribbs, Marcelline Ferrari; Colorado—Donald Phillipson, Martin Murphy Jr.; Connecticut—Barbara D'Anzi, George Wisner; Florida—Sheila Most, Vernon Harris, Richard Rieth; Hawaii—Jack Semura, Jr.; Idaho—Brent Wadsworth; Illinois—Roland Gubisch, Joseph Roos Jr.; Indiana—Dennis McCutcheon, Stephen Sheets, David Pfendler, James Tunis; Iowa—Mary Sue Wilson, Ronald Moses Jr., Edward Saulvester; Kansas—Sally Campbell, Paul Krehbiel; Louisiana—Ronnie Rambin, Betty Moore; Maryland—John Clauser, John Wood; Massachusetts—David Palmer, Theron Cole Jr., Anne Smith; Michigan—William Brenner, Jo Ann Charters; Minnesota—Perry Robinson; Montana—Arlene Markin; New Jersey—Louis Caruso, Sandra Duffield; New Mexico—James Brown; New York—Ilsa Roslow, Robert Fischer; North Carolina—Nancy Lawson; Ohio—Gail Tuttle, Ralph Grabowski; Oklahoma — Leudric Harman, David Bass, Dan Dickey; Pennsylvania—Terrance Matzuk, JoAnne Swartz, Dandridge Tomalin, Beulah Garrison, Emory Zimmers; Rhode Island—Alfred Goldberg; South Carolina — Ronald Anderson, Wilhelm Meriwether; South Dakota—Virginia Lievan, Julianne Nielson; Tennessee—Lucy Adams, James Lindsey, James Foster; Texas—Herman Weller, Robert Jernigan, Ricky Matsen, John Olsen, Fred Parce, Catherine Vreeland, Virgil Graves, George Bettle, William Cruce, William Mebane, Jay Solomon, Mary McElroy; Virginia — Frank Taylor, Charles Whitener Jr.; West Virginia—Billy Hunt; Wisconsin—David Shong.

Special additional "wish awards" provided by the Connecticut Valley Section of the Instrument Society of America for exhibits in the fields of measurement, control and data handling were presented as follows:

A $75 award to Joie Pierce Jones, 18, Abilene, Texas, for instrumentation and telemetering rockets for upper atmosphere data.

A $50 award to George R. Wisner, 17, Hartford, Conn., for an apparatus for transcribing information in Braille code.

Awards of $25 went to Robert E. Fischer, Forest Hills, N. Y., Joe Ed Gaddes, Nashville, Tenn., and John W. Kopp Jr., Yakima, Wash.

GWENDA DOWDEN—Dye study made her a winner.

Special Awards Made

Special awards by groups seeking to encourage interest in specific fields included, among others, the American Medical Association awards to Edith Katherine Schuele, 15, Memphis, Tenn., and Martin J. Murphy Jr., 16, Colorado Springs, Colo. Both winners are to show their exhibits at the AMA's big meeting in June at Atlantic City, N. J. Dr. Stanley P. Reimann of the Hahnemann Medical College presented the awards to Edith and Martin and to the two alternates, Jo Ann Charters of Bay City, Mich., and Marc Willard Deitch of Jersey City, N. J.

The American Dental Association's top awards went to Sheila Marie Most, 14, Gulfport, Fla., and Mary Sue Wilson, 15, Cedar Falls, Iowa. President-elect Dr. Paul H. Jeserich presented the awards. Awards were also presented to Albert Ceasar Simmons of Americus, Ga., and to Billy Paul Hunt of Huntington, W. Va. Their exhibits will be shown in New York in September at ADA's centennial meeting.

The American Veterinary Medical Association gave an award to Wilhelm Delano Meriwether, 16, Charleston, S. C., for his study of internal parasites found in dogs. He is to show the exhibit at the Pan American Veterinary Congress and AVMA meeting in Kansas City, Mo., in August. Dr. T. Carl Jones of Angell Memorial Hospital, Boston, Mass., presented the award. Martin Grosvenor Myers of Washington, D. C., was honored as an alternate for his study.

Other awards were made by the U. S. Army, Navy and Air Force. During the

fair, finalists had opportunities to tour the U. S. Naval Submarine Base at New London, Conn., Pratt & Whitney Aircraft Corporation, Hamilton Standard, Combustion Engineering, several life insurance companies, the University of Connecticut, Electric Boat Co., and Mystic Seaport.

Armed Services Awards

NATIONAL Science Fair projects especially relevant to science in the Navy, Army, and Air Force were honored at an Armed Forces awards luncheon.

RADM. Rawson Bennett II, USN, Chief of Naval Research, made National Navy Science Cruiser awards to: Joseph L. Page, 17, Pacific H. S., San Bernardino, Calif., for "Is Tin Can Astro-Photography Practical?"; Ronnie Rambin, 17, Fair Park H. S., Shreveport, La., for "Project Fusion"; Frederick Andrew Moore, 17, Richard Montgomery H. S., Rockville, Md., for "Experimental Investigation of Thermoelectric Cooling"; David W. Palmer, 16, North Andover H. S., North Andover, Mass., for "Missiles Muscles"; Robert E. Fischer, 15, Forest Hills H. S., Forest Hills, N. Y., for "Spectrotelescope and Spectrum Analysis"; Richard P. Bentley, 16, Tupper Lake H. S., Tupper Lake, N. Y., for "A Method of Obtaining a Complete Balance of Life Within a Closed System"; and Terrance Matzuk, 17, Palmerton Area Joint H. S., Palmerton, Pa., for "Electronic Music Synthesizer."

Each of these seven Cruisers were given a pair of precision binoculars. Since two of the seven already have been awarded Navy Science Cruises at their regional fairs, two additional winners were named National Navy Science Cruisers: John A. Labow, 16, Forest Hill Collegiate, Toronto, Ontario, Canada, for "Basic Telemetry as Employed by Earth Satellites," and George A. Hallenbeck, Jr., 17, John Marshall H. S., Rochester, Minn., for "Some Principles of Electronic Computing."

PATRICIA VAN DE VYVER—She studied plant pigments.

Named as Alternate Navy Science Cruisers were: Daniel Foster Cribbs, 16, Ventura Sr. H. S., Ventura, Calif.; George R. Wisner, 17, Bulkeley H. S., Hartford, Conn.; David Charles Brickell, 16, Jersey Shore Area Joint H. S., Jersey Shore, Pa.; and James Madison Foster, Jr., 18, East H. S., Memphis, Tenn.

Maj. Gen. H. N. Toftoy, Commanding General of Aberdeen Proving Grounds, Md., presented the Army Science Awards. Trips to Army Ordnance Missile Command, Huntsville, Ala., were awarded to Joe Ed Gaddes, 17, David Lipscomb H. S., Nashville, Tenn., for "Safe Testing of Rocket Propellants" and to William Lovel Raney Cruce, 16, Spring Branch Sr. H. S., Houston, Texas, for "Design of a Rocket Research Vehicle."

Trips to Walter Reed Army Institute of Research, Washington, D. C., were given to Karen Lee Gabbard and to Richard Serwin, 17, Pontiac Central H. S., Pontiac, Mich., for "A Preventive and a Treatment of Frostbite."

Trips to the Ballistics Research Laboratory, Aberdeen, Md., were won by David Stephen Ecklein, 18, Cedar Falls H. S., Cedar Falls, Iowa, for his "Checker Playing Digital Computer" and by Henry Woods Bowman, 17, Charleston H. S., Charleston, W. Va., for "Magnetohydrodynamic Friction Reduction."

Trips to the U. S. Army Research and Development Laboatory at Fort Monmouth, N. J., were given to David Paul Eartly, 17, Bishop Noll H. S., Hammond, Ind., for his "Methods and Procedures in Electron Microscopy," and to Ralph Edward Grabowski, 17, Benedictine H. S., Cleveland, Ohio, for his project on "Nuclear Magnetic Resonance and Spectrometry."

Maj. Gen. Leland S. Stranathan, Director of Development Planning at U. S. Air Force Headquarters, presented the U. S. Air Force and Air Force Association citations to Joie Pierce Jones, 18, of Abilene High School, Abilene, Texas, as the winner of the Air Power Award for his "Experiment, Design, and Application of Solid Propellant Rockets to Radiation Studies of the Upper Atmosphere," and to Robert E. Fischer, 15, Forest Hills, H. S., Forest Hill, N. Y., as winner of the Air Exploration Award for his project, "Spectrotelescope and Spectrum Analysis."

Brent Earl Wadsworth, 17, Idaho Falls H. S., Idaho Falls, Idaho, was named alternate Air Power winner for his "Gyro-Controlled Guidance System," and David Wesley Shong, 17, Pewaukee H. S., Pewaukee, Wis., was designated alternate Air Exploration winner for his project "Simulated Gravitation Field."

The two winners will be guests at the Airpower Panorama in Miami.

ERIC VOLLRATH—He studied protozoa.

Bauernfeind, 18, Butler H. S., Butler, N. J.;

made her a winner.

Army, Navy and Air Force. During the

GENERAL SCIENCE

Praise and Advice

PRESIDENT EISENHOWER sent the following telegram:

"To the students and teachers assembled at the Tenth National Science Fair, I send greetings. Our age of science demands the fullest development of all our human resources and abilities. The Science Clubs of America contribute importantly to this development. Best wishes for the success of your Science Fair."

Remarks by Dr. C. S. Draper, director of Massachusetts Institute of Technology Instrumentation Laboratory:

Recognition of boys and girls with outstanding talents for leadership should be made early in their educational careers. Once well-qualified individuals are identified, fellowships, scholarships, assistantships, research grants, and the many other encouragements toward advanced education that are now available may be brought into action to make sure that opportunities for classroom and laboratory studies are given to able students. Beyond these formal phases of personal development, it is important to provide potential leaders with experiences in independent thinking coupled with active work on problems of actual practice. After schooling is over, education of all sorts must and will continue throughout the career of any person who deals with the situations of our modern world. Any leader who does not keep himself abreast of essential changes in his environment will not be likely to retain a position of prominence for long.

Individuals differ among themselves so greatly that no single path for education can be acceptable for all students. Many patterns must be established; law, religion, medicine, business, humanities, science, engineering, and other disciplines may all provide the background of knowledge and experience to bring out latent creativity and leadership. Aside from the detailed bodies of information involved, the differences between persons trained in the various disciplines lie in the mental attitudes and methods of attack on problems.

Science fairs make tremendous contributions to the development of youth for the responsibilities of adult living. The science fair method is to provide an arrangement under which boys and girls may benefit from the use of personal initiative. . . .

Dr. Louis M. Orr, president-elect of the American Medical Association:

As I witness the outstanding results of your talents and enthusiasms in your exhibits, I feel that your achievements deserve a generous portion of our interest, enthusiasm, and encouragement.

To those of you who are seriously planning to continue your career in the various fields of medical science, may I say that your opportunities have never been better, nor your horizons more far-reaching. The practice of medicine has changed dramatically in the last 25 years. It shows every evidence of changing just as dramatically in the next 25. This age of the atom and space is just one area which holds unprecedented promise for the inquiring mind. Change always brings opportunity to those who are alert and ready for it.

For example, authorities in the electrical engineering research field believe that scientific fields will merge. They see a closer relationship between the abstract and the medical, for instance, in the study of the brain. Brain specialists, working with physicists, engineers, chemists, and physicians will one day combine their knowledge as a step forward in understanding the brain and how it works.

More than that, in order to work effectively together, these varied scientific fields will develop a common language—an understanding of each other's professional terms—and through this come to recognize the way in which each individual specialty contributes its part to the final understanding of the common problem. We do not have such understanding yet. However, a beginning is being made.

Science is frequently a lonely endeavor, in some cases an isolated endeavor. It is easy for scientists to confine themselves and their thinking to their immediate problems, interests and specialties. It is usual for them to communicate only with each other. If young people like yourselves devote your time to scientific delving exclusively, you will probably hardly notice that you are growing up in a restricted world filled only with the requirements of your interest.

It is on this point of scientific isolation that I want to express a word of caution.

ROBERT R. DICKEY—This young scientist worked with embryos for his award-winning project.

JOIE PIERCE JONES—Award winner is shown with drawings of rocket.

Today, we have a tendency to insist from every scientist a dedication so complete that we are in some danger of creating a sort of totalitarian man as a single-purposed and as dominating as a totalitarian state.

I believe that dedication is the backbone of achievement, but it should have a broad base. The individual must be prepared not just to work, but to live—at the same time both as a unique person and as a fellow member of the human race. American philosophy places a fundamental value on its regard for the uniqueness and worth of the individual in his own right. The individual is the end of the free society.

We should not make the mistake of thinking science into a narrow channel. A scientist must be concerned with the environment in which he lives. One of the most frustrating aspects of contemporary life is its tendency to develop compartmental divisions. Business is business, politics is politics, science is science. We have all heard the often repeated fear that our scientific knowledge has far outstripped our human and moral understanding so that we are in danger of destroying ourselves. Without widespread understanding, it could be true. . . .

Maj. Gen. H. N. Toftoy, Commanding General, Aberdeen Proving Ground:

The Army's interest in the development of scientists and engineers is long and honorable. It stems from the earliest days of its history. It led to the founding of the United States Military Academy on July 4, 1802, at an Army Post known as West Point.

History records how the U S. Army gave the light of inspiration which has guided American scientists and engineers for many years. And it was your forebears in the fields of science who worked closely with Army research and development through those years. Today, the Army with scientists and engineers, both civilian and military, has built a vast, imaginative research and development program to plan and equip the United States Army of the future for our national defense. . . .

ERIC VOLLRATH—He studied protozoa.

Airpower Panorama in Miami.

Science News Letter, May 23, 1959

ENGINEERING

Damping Capacity of Metals Is Design Factor

THE RINGING sound you expect to hear when you tap quality glassware or flip an authentic coin on the counter is due to a material property known as damping capacity.

Lack of this damping capacity or ability to deaden vibration, can lead to irritating resonance in the sounding board of a piano or the amplifier of a radio, phonograph or television.

This "shock absorber" nature of materials is beginning to be recognized as an important factor in the design of hundreds of different objects from hi-fi sets to guided missiles, the U. S. Bureau of Mines has reported.

Damping capacity enables some metals to withstand the weakening effects of vibration, but this knowledge has not been applied widely in architectural and engineering design. There, its significance is only now becoming apparent, the Bureau said.

Low damping capacity in metals has been blamed for bridge failures and airplane crashes. Vibration fatigue can also be a trouble source in missiles traveling at supersonic speeds.

Bureau investigations in this field are concentrated the the Mississippi Valley Research Center. Rolla, Mo., where considerable progress has been made in finding ways to measure the damping capacities of many metals.

This progress is described in a Bureau publication, Report of Investigations 5441, "Damping Capacity—Its Measurement and Significance," obtainable from the Bureau of Mines, Publications—Distribution Section, 4800 Forbes Ave., Pittsburgh 13, Pa.

Science News Letter, May 23, 1959

BACTERIOLOGY

Leprosy-Causing Bacteria Live Long in Culture

A STRAIN of leprosy-causing bacteria has been successfully grown in tissue culture for periods as long as seven weeks.

Researchers have spent many years attempting to maintain the growth of the leprosy bacillus outside the body. Now, Dr. Y. T. Chang of the National Institute of Arthritis and Metabolic Diseases, Bethesda, Md., has a culture growth that lasts long enough for scientists to make drug tests.

The bacteria cause leprosy in rats, he reported at the Federation of American Societies for Experimental Biology meeting in Atlantic City, N. J.

This culture will allow a more detailed study of the bacteria and provide a means for the rapid testing of possible antileprosy drugs.

The leprosy bacillus has proven to be one of the most difficult of all types of bacteria to grow outside its natural host, and although it grows vigorously inside body cells, it will stop multiplying and soon die if placed in an artificial environment.

Dr. Chang's bacteria are the Hawaiian strain of an organism known as *Mycobacterium leprae* murium, which causes leprosy in rats.

These bacteria do not cause leprosy in man but they do belong to the same bacteria family as human leprosy bacilli. The two types are so similar they cannot be differentiated under the microscope.

The cells for the culture growth are obtained from the body cavities of mice. They are known as macrophages, large mononuclear cells whose function in the body is to surround, ingest and destroy foreign matter.

Past attempts by other investigators to get the bacteria to grow in cell cultures have resulted in only limited bacterial multiplication. In one of Dr. Chang's cultures, the number of bacilli increased seven times in seven weeks.

Science News Letter, May 23, 1959

MEDICINE

Lung-Cancer, Smoking Statistics Challenged

THE STATISTICAL studies that link smoking with eventual lung cancer have been challenged.

The question of the cause of cancer is biological, not statistical, a doctor charges.

Two of the most famous of these studies, that of Doll and Hill in England and Hammond and Horn in the United States, are the subject of his discussion of the validity of the conclusion that smoking causes lung cancer.

Dr. Joseph Berkson, section of biometry and medical statistics, Mayo Clinic, Rochester, Minn., explained that the studies revealed more than the alleged smoking-cancer link.

For instance, the Hammond-Horn studies supervised by the American Cancer Society, show that persons who smoked died of other diseases too. In fact, only 13.5% of the deaths weere due to lung cancer, their second study showed. The remainder died of causes other than lung cancer.

Another 13.5% of the deaths were due to other types of cancer. The largest proportion of deaths was attributed to coronary heart disease, Dr. Berkson points out.

The death rate from cancer of the lung among smokers was larger than among nonsmokers in the sample population, but lower than the death rate from cancer of the lung among the general population. The general and specific death rates in both groups' studies were low compared with corresponding death rates for the general population.

The theory that smoking causes lung cancer is derived from statistical studies, the researcher says. But the question of the cause of cancer is basically a biologic, not a statistical problem. The reports contained no substantial clinical, pathologic or other independent direct evidence that smoking was the cause of lung cancer, he emphasizes. Dr. Berkson's paper is reprinted in the *Proceedings of the Staff Meetings of the Mayo Clinic* (May 15).

Science News Letter, May 23, 1959

IN SCIEN

PHYSICS

Lithium Found High In Northern Atmosphere

LITHIUM, used for making hydrogen bombs, has now been found high in the atmosphere over the Northern Hemisphere for the first known time.

Source of the lithium has not yet been determined but many scientists have blamed its presence in the Southern Hemisphere on the hydrogen bomb tests conducted in the South Pacific by the United States. Other speculative sources named have been meteors and the evaporation of sea water.

Dr. A. Vallance Jones of the University of Saskatchewan in Canada says that he found evidence of lithium in the upper atmosphere near Saskatoon during the period Jan. 10 to 29. The hydrogen bomb element could have come from nuclear explosions, he reports in *Nature* (May 9).

However, Dr. Jones points out, a sea water or meteoric origin must also be considered possible until further measurements have been made.

Science News Letter, May 23, 1959

PUBLIC HEALTH

Strontium-90 Absorption Predicted for Children

MORE EVIDENCE has been collected in the attempt to predict the future distribution of strontium-90 for the entire world population.

Samples of human bone received from about 35 stations throughout the world have been analyzed and the amount of strontium-90 calculated for adults and children. On the basis of these tests Drs. J. Laurence Kulp, Arthur R. Schulert and Elizabeth J. Hodges of Columbia University's Lamont Geological Observatory have predicted how much of this fallout product will appear in a young child's bones less than 10 years from now.

In 1966, they say, the average young child in the world will have about four micromicrocuries of strontium-90 per gram of calcium. Some 10% may get as much as eight micromicrocuries; one percent may reach as high as 20.

In January, 1958, the average amount of strontium-90 in adults' skeletons was 0.19 micromicrocuries, about one-twentieth the amount predicted for young children in 1966. At that date the amount for all persons, including children, in the world was about 0.52 micromicrocuries per gram of calcium.

It is still not certain what hazards these levels present to the human race, the scientists conclude in *Science* (May 8).

Science News Letter, May 23, 1959

cally in the last 25 years. It shows every

his award-winning project.

future for our national defense. . . .

Science News Letter, May 23, 1959

CE FIELDS

EDUCATION

Engineer Enrollment Drops First Time in Years

IN THE face of the nation's greatest need for trained engineers and scientists, freshman engineering enrollment declined markedly in 1958 for the first time in eight years.

Furthermore, one in five engineering schools expects a further drop in freshman enrollment next fall.

Last year, 70,029 engineering freshmen enrolled in the nation's schools compared with 78,757 in 1957. This was a drop of 11.1%. Total college freshmen enrollment in 1958, however, was up seven percent over the previous year.

These facts were contained in a report made public by the Engineers Joint Council, covering 223 institutions in the United States granting degrees in engineering.

Heads of engineering schools said applications from qualified students have fallen for these three reasons:

1. A false appraisal of the long-range engineering career opportunities by counselors, students and parents, based on reports in the general press on lay-offs during the 1957-58 recession.

2. Increased concern about the rigors of engineering curriculum.

3. Increased interest by potential engineering students in other scientific fields.

Engineers Joint Council is a national federation of 20 major engineering societies representing 300,000 of the country's engineers.

Science News Letter, May 23, 1959

BACTERIOLOGY

New Deadly Diseases Made From Tiny Molds

THE TINY mold that causes "athlete's foot" has been turned into a new deadly disease.

Deliberately designing new diseases from molds may now be possible, a microbiologist reported to scientists at the Society of American Bacteriologists meeting in St. Louis, Mo.

Usually molds that cause athlete's foot will grow only on the skin. If one of these molds is injected into an animal's body, it will not cause disease even though huge amounts are given. Now, however, there is evidence the relatively harmless molds can be changed into deadly forms, Dr. George H. Scherr of the University of Illinois College of Medicine said.

Three different molds were placed in small cellophane bags which were then surgically implanted into the body cavities of rabbits. The molds could not escape, but nutrients could enter, keeping the molds alive. In each case, the mold gradually began to change its shape, Dr. Scherr said, and in approximately 20 days "had assumed a form and character completely different from the one placed in the cellophane bag."

When each new mold was injected into rabbits and mice, a severe infection resulted which destroyed the animals' internal organs. If the disease was transferred from animal to animal, it became progressively worse. No way is now known to combat the new disease, Dr. Scherr explained.

The disease caused by the changed molds may be regarded as different from any disease known, he said.

The study may contribute to knowledge of how some bacteria suddenly can infect man and animals.

John W. Rippon, one of Dr. Scherr's students, worked with him in the study.

Science News Letter, May 23, 1959

GENERAL SCIENCE

Oppenheimer Urges End Of Arms as Arbiters

THE ABILITY of the inherited institutions of our civilization to make proper decisions on uses of the unprecedented new instruments of warfare, like atomic energy, was called in question by Dr. Robert Oppenheimer, atomic energy pioneer and director of the Institute for Advanced Study, Princeton, N. J., in opening a symposium in New York on basic research.

Arms must not continue to be the last arbiter of disputes, he said.

"If we do not treasure the great inheritance on which all our work and life are based, and understand the radical novelty and the gravity of the situation in which we find ourselves," he warned, "there will be few of our children to ask again of the need for new knowledge."

Dr. Oppenheimer and other speakers urged the need of continued basic research, or inquiry directed not primarily to a practical result but to the obtaining of new knowledge.

No laboratory should be so directed to its practical missions that it cannot afford perhaps a sixth or a fifth of work that is on the face of it unrelated to its purposes, Dr. Oppenheimer said.

The great lesson of the past atomic decades has been, he observed from his direction of atomic bomb research, that men of science who have spent their whole lives in the quest of new knowledge may be among the most gifted practitioners of technology.

Dr. Alan T. Waterman, director of the National Science Foundation, Washington, declared that for continued growth in scientific research and technology and for realization of the full potential in basic research, there must be widespread public recognition and appreciation of the importance of intellectual and scholarly activity.

Dr. W. O. Baker, vice president, Bell Telephone Laboratories, advocated transference to practice in mathematical reasoning a fraction of the time given to learning of physical skills which are of diminishing importance.

Science News Letter, May 23, 1959

ROCKETS AND MISSILES

Returned Space Capsule Given to Smithsonian

THE FIRST instrumented capsule recovered intact from outer space after returning to the earth's surface at free-falling speed was presented to the Smithsonian Institution on May 15.

Officials of the U. S. Air Force said the "Data-Sphere," which is 18 inches in diameter, was launched on June 13, 1958, from Cape Canaveral, Fla. It rose more than 200 miles, re-entered the earth's atmosphere at a speed of more than 10,000 miles an hour and was ejected from the nose cone of its rocket without parachute or other retarding device.

After falling freely, the capsule struck the South Atlantic with an impact 40,000 times greater than the force of gravity. The sphere presented to the Smithsonian is the first of a series of such capsules recovered from Thor and Atlas missile firings. Each is equipped with a tiny tape recorder, a battery power-pack, dye marker, and a "bomb" that sends out a sound to indicate its location for recovery purposes.

Data recorded include temperatures, pressures, stresses during take-off and climb, conditions at the greatest altitude attained, heat encountered during re-entry into the atmosphere, and the tremendous forces of final impact as the capsule slammed into the water.

As presented to the Smithsonian, the sphere has all its original instruments installed, still surrounded by the foamlike mass that kept them from shifting inside the plastic capsule. The sphere's upper half is yellow to make it more visible, and the bottom half is coated with a greenish-black fish-repellent chemical.

Science News Letter, May 23, 1959

ASTRONOMY

Rediscovered Comet May Give Fall Meteor Display

A COMET expected to give a good display of meteors this fall has been rediscovered by Elizabeth Roemer of the U. S. Naval Observatory in Flagstaff, Ariz.

Although it is now much too faint to be seen without a very large telescope, the comet will brighten sufficiently by late October to be visible with binoculars or a small telescope. Known as Comet Giacobini-Zinner, the object is remarkable for the showers of meteors it produced in 1933 and 1946.

The comet will be within about 30,000,000 miles of the earth on Nov. 7, and the meteor display is expected about the same time.

News of the comet's rediscovery when it is only a faint magnitude 20 was reported to astronomers in the Western Hemisphere by Harvard College Observatory, Cambridge, Mass.

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ASTRONOMY

Four Planets Now Visible

With four of the five planets that can be seen without a telescope visible during June, this month promises an unusual display of naked-eye planets.

By JAMES STOKLEY

THE BEST DISPLAY of naked-eye planets for a considerable length of time is visible on June evenings. Venus, Mars, Jupiter and Saturn, all that are ever visible without a telescope, except for Mercury, can now be seen at the same time. (Mercury is too nearly in the same direction as the sun to be seen.)

All these planets, as well as the brighter stars, are shown on the accompanying maps as they appear about ten p.m., your own kind of standard time (add one hour for daylight saving time) at the first of June, and an hour earlier at the middle of the month (when the sky is actually not very dark).

Long before any other planet or star appears, Venus can be seen in the west. Its magnitude is now minus 3.9 on the astronomer's brightness scale, and it stands in the constellation of Cancer, the crab. On June 15 Venus will be 71,800,000 miles from earth.

Mars Close to Venus

Close to Venus, when the sky gets darker, you will see Mars. At a distance of 205,400,000 miles, on the 15th, it is only about a hundredth as bright as Venus. On June 1 Venus will be well below Mars; both are moving toward the east and Venus passes Mars on the morning of June 14. They will be invisible in the United States at the time of closest approach, but on the preceding and following evenings they will appear unusually near each other.

Jupiter is the second brightest planet. It is in the south in Libra, the scales, at a distance of 415,000,000 miles. But even though it is so far, its magnitude is minus two, which makes it a little more than a sixth as bright as Venus.

The fourth planet, Saturn, is low in the southeast, in Sagittarius, the archer; its distance is 843,000,000 miles. In magnitude it is plus 0.3, equal to a bright first magnitude star. However, its low altitude makes Saturn appear fainter, because of absorption of its light by the earth's atmosphere.

Among the stars which, unlike the planets, shine with their own light, the brightest is Vega in Lyra, the lyre, high in the east. Below this group is Cygnus, the swan, with first magnitude Deneb. Like Saturn, this is somewhat dimmed because it is rather low in the sky. To the right is Altair, in Aquila, the eagle.

High in the south is Arcturus, in Bootes, the bear-driver. Below it is Virgo, the virgin, with Spica. To the right of this group you will find Leo, the lion, of which Regulus is the brightest star. Low in the southeast, to the left of Libra, is the scorpion, Scorpius, with first magnitude Antares, another star that is dimmed by its low altitude.

Even more dimmed are two stars shown low in the northwest; Pollux, in Gemini, the twins, and Capella, in Auriga, the charioteer. Both were very prominent in the winter evening sky, but the stars are now about to disappear for a "summer vacation."

On Sunday, June 21, at 10.50 p.m. EST (9:50 p.m., CST; 8:50 p.m., MST; 7:50 p.m. PST; add one hour to each for corresponding DST) the sun reaches its farthest north position for the year, when it will be over the Tropic of Cancer. Actually, at that moment, it will be directly over a point in the Pacific Ocean, off the island of Formosa. This is the time of the summer solstice, which marks the beginning of summer in the Northern Hemisphere. In the Southern Hemisphere, it is the beginning of winter.

With four planets visible in June in the evening sky, and the earth, as always, visible at our feet, we can see a considerable part of the solar system.

One striking feature of this family of planets which revolve around the sun, and one that few appreciate, is that it is mostly empty space. This makes it quite impractical to construct an accurate model, although many models have been made.

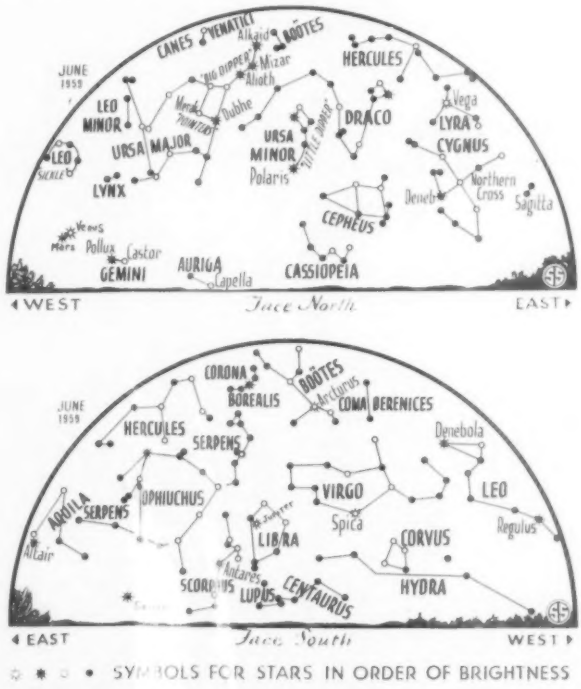
One type is called the orrery, named after a famous one that was constructed more than two hundred years ago for an Irish nobleman, the Earl of Orrery. A more modern one is displayed in New York City at the Hayden Planetarium, with balls representing the planets revolving on tracks around a glowing sun.

But any such model gives the idea that the solar system is much more crowded with planets than it actually is. If you make the ball representing the sun of reasonable size, the planets are microscopic, and spread over an area too large for convenience.

Large-Scale Orrery

Washington, D. C., might be a good place for such a model, and the dome of the Capitol might represent the sun. The outside diameter of the dome is slightly over 135 feet. Where, then, would the planets be placed, and how large would the balls representing them have to be?

For Mercury a ball about 5½ inches in diameter would be needed, and it should be placed slightly more than a mile away from the sun. This could put it inside the Department of Justice building at 9th Street and Pennsylvania Avenue. Venus, the next



planet, would be a ball about 14¼ inches in diameter, and it might rest on the President's desk in the White House, about two miles from the Capitol dome. The earth? A ball about 15 inches in diameter, over in Arlington in front of the Pentagon, nearly three miles away. Mars is out in the Washington Zoological Park, about 4¼ miles from the sun. Its diameter: 7¾ inches.

The Jupiter ball is considerably larger, 13 feet 7 inches in diameter; it is located down the Potomac at Fort Belvoir, just below Mt. Vernon and somewhat more than 14 miles from the Capitol. Saturn must be placed about 26 miles away, in Annapolis. Its diameter is 11 feet, 2 inches. Uranus, about 4 feet 7 inches in diameter, is 53 miles away, in Fredericksburg, Va. Neptune is a little smaller, 4 feet, 4 inches in diameter. It is 82½ miles distant, which would place it in Pennsylvania, south of Harrisburg. And Pluto, at its mean distance, is 109 miles away. This would put it, a ball 6¾ inches in diameter, in Chester, Pa., a little south of Philadelphia.

Finally there are the asteroids. These are a group of tiny planets, some a mile or less in diameter, that move generally in orbits between those of Mars and Jupiter. Many thousands are within reach of great telescopes. On our model these would be represented by a truck load of sand and pebbles, scattered around a circle about eight miles from the Capitol.

The total area within the circle representing Pluto's orbit would be about 37,000 square miles. With nothing in this region except the dome, the nine balls, ranging from a few inches to 14 feet in diameter, plus the sand and pebbles, you can see how empty the solar system actually is!

Celestial Time Table for June

June	EST	
4	3:00 a.m.	Moon farthest, distance 252,500 miles.
6	6:53 a.m.	New moon.
10	9:52 a.m.	Moon passes Venus.
	1:15 p.m.	Moon passes Mars.
14	12:22 a.m.	Moon in first quarter.
	8:00 a.m.	Venus passes Mars.
18	6:02 a.m.	Moon passes Jupiter.
19	8:00 a.m.	Moon nearest, distance 223,500 miles.
20	3:00 p.m.	Full moon.
	11:51 p.m.	Moon passes Saturn.
21	10:50 p.m.	Sun farthest north, beginning of summer.
23	3:00 a.m.	Venus farthest east of sun.
25	10:00 p.m.	Saturn nearest, distance 840,700,000 miles.

Subtract one hour for CST, two hours for MST, and three for PST.

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Do You Know

The U. S. death rate from the four principal communicable *diseases of childhood*, measles, scarlet fever, whooping cough and diphtheria, under age 20 fell from 143.0 per 100,000 in 1910 to 1.5 in 1956, or 99%.

The U. S. alone receives each year approximately 1,500 times its total present *energy* demand in the form of sunlight.

• Books of the Week •

For the editorial information of our readers, books received for review since last week's issue are listed. For convenient purchase of any U. S. book in print, send a remittance to cover retail price (postage will be paid) to Book Department, Science Service, 1719 N Street, N.W., Washington 6, D. C. Request free publications direct from publisher, not from Science Service.

ADVENTURES IN CHEMISTRY: The Hows and Whys of Chemistry, 200 Safe Experiments—Nathan Feifer—*Sentinel Bks,* 128 p., illus., paper, $1. Presents the basic theory of chemistry on the elementary level, employing for experiments household materials and inexpensive laboratory equipment.

AIR POLLUTION CONTROL—W. L. Faith—*Wiley,* 259 p., illus., $8.50. States the basic facts that must be considered in any air pollution control program, and offers practical methods of solving air pollution control problems.

THE BOYS' BOOK OF ASTRONOMY—Patrick Moore—*Roy Pubs.,* 143 p., illus., $3. Well illustrated reference work for boys and girls by the president of the British Junior Astronomical Society.

CAN MAN BE MODIFIED?—Jean Rostand, transl. from French by Jonathan Griffin—*Basic Bks,* 105 p., $3. Predictions of man's biological future by one of France's outstanding experimental biologists.

A CONCISE ENCYCLOPEDIA OF WORLD TIMBERS—F. H. Titmuss—*Philosophical Lib.,* 264 p., 30 photomicrographs, $15. Describes the structure, characteristics and uses of nearly 200 different kinds of timber.

CONTRIBUTIONS TO THE THEORY OF GAMES, VOL. IV—A. W. Tucker and R. D. Luce, Eds.—*Princeton Univ. Press,* 453 p., paper, $6. Devoted to recent work in n-person games, dedicated to the memory of John von Neumann.

THE CRYSTAL STRUCTURE OF ANTIMONY PENTACHLORIDE AT −30°—Stanley M. Ohlberg—*Mellon Institute,* 3 p., illus., paper, free upon request direct to publisher, 4400-5th Ave., Pittsburgh 13, Pa.

A DICTIONARY OF AMERICAN PROVERBS AND PROVERBIAL PHRASES, 1820-1880—Archer Taylor and Bartlett Jere Whiting—*Belknap Press,* 418 p., $9.50. Collection of proverbial phrases found in American works published between 1820 and 1880, years rich in regional literature.

THE EARTH: Its Origin, History and Physical Constitution—Sir Harold Jeffreys—*Cambridge Univ. Press,* 4th ed., 420 p., illus., $13.50. Principal changes are in the treatment of tidal friction, new investigations of the thermal history of the earth and expanded section on the moon's surface features.

ELEMENTS OF WAVE MECHANICS—N. F. Mott—*Cambridge Univ. Press,* 165 p., paper, $2.95. Reprint of 1952 edition, intended for students in the final year of experimental physics.

FORTY-FOURTH ANNUAL REPORT OF THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS, 1958, Administrative Report without Technical Reports—*Govt. Print. Off.* for NACA, 115 p., illus., paper, $1. Final report of the agency which on October 1, 1958 became the National Aeronautics and Space Administration.

FUNDAMENTALS OF HIGH FIDELITY—Herman Burstein—*Rider,* 144 p., illus., paper, $2.25. Emphasis is on what an amplifier should provide, and how to choose the best equipment.

FUTURE JOBS FOR HIGH SCHOOL GIRLS—Miriam Keeler—*Women's Bureau (Govt. Print. Off.),* 64 p., illus., paper, 40¢. Describes occupations, some technical and skilled, for which graduation from high school is basic requirement.

GREGOR MENDEL: Father of the Science of Genetics—Harry Sootin—*Vanguard,* 223 p., illus., $3. Explains Mendel's experiments in simple terms, biography for young people.

HOW TO STUDY SCIENCE—Louis Haber and Lawrence Samuels, Glen R. Rasmussen, Ed.—*College Entrance Pubs.,* 81 p., illus., paper, $1. To help the science student use special techniques and efficient methods in studying science.

INDIAN SILVERWORK OF THE SOUTHWEST, ILLUSTRATED, VOL. I—Harry P. Mera—*Dale Stuart King,* 122 p., 198 photographs, paper, $1. Pictorial presentation of the progress from early simple forms to later more complex styles developed by Indian craftsmen.

INTRODUCTION TO HUMAN ANATOMY—Carl C. Francis—*Mosby,* 3rd ed., 548 p., illus., $5.75. Chapter on endocrine system and section on the autonomic nervous system brought up to date.

LABORATORY EXERCISES IN ANIMAL BIOLOGY—Dale C. Braungart—*Mosby,* 5th ed., 244 p., paper, $3.50. To be used with general zoology textbooks.

THE MAGIC YEARS—Understanding and Handling the Problems of Early Childhood—Selma H. Fraiberg—*Scribner,* 305 p., $3.95. Discusses the typical problems of each developmental stage during the first five years of normal childhood. For parents.

MECHANICS OF MACHINES: Elementary Theory and Examples—John Hannah and R. C. Stephens—*Arnold, E. & Co. (St. Martins),* 238 p., illus., $5. First year engineering course.

MEDIEVAL AND EARLY MODERN SCIENCE, VOL. I: Science in the Middle Ages, V-XIII Centuries. Vol. II: Science in the Later Middle Ages and Early Modern Times, XIII-XVII Centuries—A. C. Crombie—*Doubleday,* rev. 2d ed., 296 p. and 380 p. resp., illus., paper, 95¢ each. Contains 62 pages of bibliography.

MORE ABOUT THE BACKWARD CHILD—Herta Loewy—*Philosophical Lib.,* 138 p., illus., $4.75. Guide for parents and teachers, showing Miss Loewy's method in reading, writing and arithmetic, in speech training, music and rhythm.

THE NEW WORLD OF MATH—George A. W. Boehm and the Editors of FORTUNE—*Dial Press,* 128 p., diagrams by Max Gschwind, $2.50. Deals with modern mathematics, pure and applied, and takes up the future of computers. Articles first appeared in FORTUNE.

PACIFIC SCIENCE BOARD: Bi-Annual Report 1957-58—Alexander Spoehr, Chmn.—*Pacific Science Bd., NAS-NRC,* 71 p., paper, free upon request direct to publisher, Washington 25, D. C. Scientific investigation in Micronesia and other reports.

THE PHYSICAL SCIENCES—E. J. Cable and others—*Prentice-Hall,* 4th ed., 553 p., illus., $6.95. Comprehensive but not highly technical presentation for the general college student who lacks higher mathematics.

PLANT LIFE—Lorus J. Milne and Margery Milne—*Prentice-Hall,* 283 p., illus., $6.95. Emphasis is on the dynamic aspects of botany as an advancing science and what it means to man. Textbook.

PLANT PROPAGATION: Principles and Practices—Hudson T. Hartmann and Dale E. Kester—*Prentice-Hall,* 559 p., illus., $8.75. Encyclopedic coverage of propagation methods, based on current research findings in the field.

PRELOGICAL EXPERIENCE: An Inquiry into Dreams & Other Creative Processes—Edward S. Tauber and Maurice R. Green—*Basic Bks.,* 196 p., $3.75. Two psychoanalysts examine cases of

dreams, hallucinations, conditions of brain damage and experimentally induced states.

RESEARCH IN SPACE SCIENCE, Special Report No. 23: The Orbit of Satellite 1958 Zeta—G. Veis—*Smithsonian Astrophysical Observatory*, 80 p., paper, single copies free upon request direct to publisher, Cambridge 38, Mass. Preliminary orbital analysis of Atlas rocket.

ROCKET ENCYCLOPEDIA ILLUSTRATED—John W. Herrick and Eric Burgess, Eds., foreword by Theodore von Karman—*Aero Pubs.*, 607 p., illus, by Wayne Lanford, photographs, $12.50. Encyclopedic presentation of material published on specific research and design problems, technically correct for research man, yet understandable to the layman or beginner.

THE SLEEP WALKERS: A History of Man's Changing Vision of the Universe—Arthur Koestler, introd. by Herbert Butterfield—*Macmillan*, 624 p., $6.50. Beginning with the earliest Greek astronomers, the author charts man's broadening vision, pays particular attention to the contributions of Copernicus, Galileo, and above all, Kepler.

THE STRUCTURE AND FUNCTION OF SUBCELLULAR COMPONENTS—E. M. Crook, Ed.—*Cambridge Univ. Press*, 100 p., illus., $4.25. Symposium discussed the question whether a cell has a real "geography" in the sense that its parts are held in place in relation to one another.

TECHNOLOGY IN AMERICAN WATER DEVELOPMENT—Edward A. Ackerman and George O. G. Löf; Conrad Seipp, Asst.—*Johns Hopkins Press* for Resources for the Future, 710 p., illus., $10. Review of technological changes important in water development and water supply engineering.

A TEXTBOOK OF FLUID MECHANICS FOR ENGINEERING STUDENTS—J. R. D. Francis, Chapter on Gas Flow by G. Jackson—*Arnold, E. & Co. (St. Martins)*, 332 p., $6.50. For first two years of engineering course.

35mm PHOTOGRAPHY: Approaches and Techniques with the Miniature Camera—Jacob Deschin—*Camera Craft*, rev. 2nd ed., 192 p., illus., $5. Stresses techniques as a means of communicating impressions.

TOWARD UNDERSTANDING STUTTERING—Wendell Johnson—*Nat. Soc. for Crippled Children & Adults*, 40 p., paper, 25¢. Tells how parents can help their child toward better speech.

TRACKWAYS OF LIVING AND FOSSIL SALAMANDERS—Frank E. Peabody—*Univ. of Calif. Press*, 71 p., illus., 11 plates, paper, $1.50. Deals with living terrestrial salamanders of western North America and fossil trackways from Lower Pliocene strata of the Sierra Nevada.

TRANSLATIONS OF RUSSIAN GAME REPORTS, Vol. 5 (Sable and Squirrel, 1951-55); Vol. 6 (Trapping and the Fur Industry, 1951-55)—V. L. Zaleker, I. D. Kiris and others, transl. from Russian by J. M. MacLennan—*Canad. Dept. of Northern Affairs & National Resources (Queen's Printer, Ottawa)*, 145 p. and 158 p. resp., paper, $1 each. Of interest to game administrators and biologists. Last of series.

VEGETATION OF THE OUTER BANKS OF NORTH CAROLINA—Clair A. Brown—*La. State Univ. Press*, 179 p., illus., paper, $3. Monograph on characteristic vegetation of grass-covered dunes, sand flats and salt marshes of the Cape Hatteras area.

WORKING WITH ANIMALS—J. Myron Atkin and R. Will Burnett—*Rinehart*, 67 p., illus. by Raymond Perlman, paper, $1. Source booklet of activities about animal life for elementary school teachers. Emphasis is on science work the children can try out, feel, see and touch.

WORKING WITH PLANTS—J. Myron Atkin and R. Will Burnett—*Rinehart*, 58 p., illus. by Raymond Perlman, paper, $1. Source for elementary science teachers, to give children basic understanding of how plants live and grow.

PHYSIOLOGY

Cat's Brain Cells Respond When Cat Pays Attention

FOUR SCIENTISTS at Walter Reed Army Institute of Research have discovered certain cells in a cat's brain that respond to noise only if the cat is "paying attention" to the source of the sound.

The cells were found in the auditory cortices of the brains of seven unrestrained and unanesthetized cats.

David H. Hubel, Calvin O. Henson, Allen Rupert and Robert Galambos report in *Science* (May 8) that it was not easy to understand why a cat's brain should contain such cells.

It is thought the cells may become activated only when certain other conditions occur simultaneously.

From experimental data attained, the scientists conclude that the neural processes responsible for attention play an important role in determining whether or not a given acoustic stimulus proves adequate.

Science News Letter, May 23, 1959

PHOTOGRAPHY

Photogrammetric Printer Speeds Photography

A PRINTER for making aerial photographs allows a plane to photograph a wider area with fewer passes over the "target."

Now a plane can take five simultaneous pictures in a single pass—to the front, rear, right and left at oblique angles, as well as directly downward.

The new photogrammetric printer corrects the negative projections so that all five photographs look as though they had been taken straight down.

Corrected photographs have extreme sharpness of detail. The printer is claimed to have a "higher degree of resolution and illumination uniformity" than any similar instrument. It should speed up aerial mapping tasks and reduce their cost.

Four of the printers have already been ordered by the U. S. Department of Interior Geological Survey for aerial mapping use. They were developed by J. W. Fecker, Inc., Pittsburgh, Pa.

Science News Letter, May 23, 1959

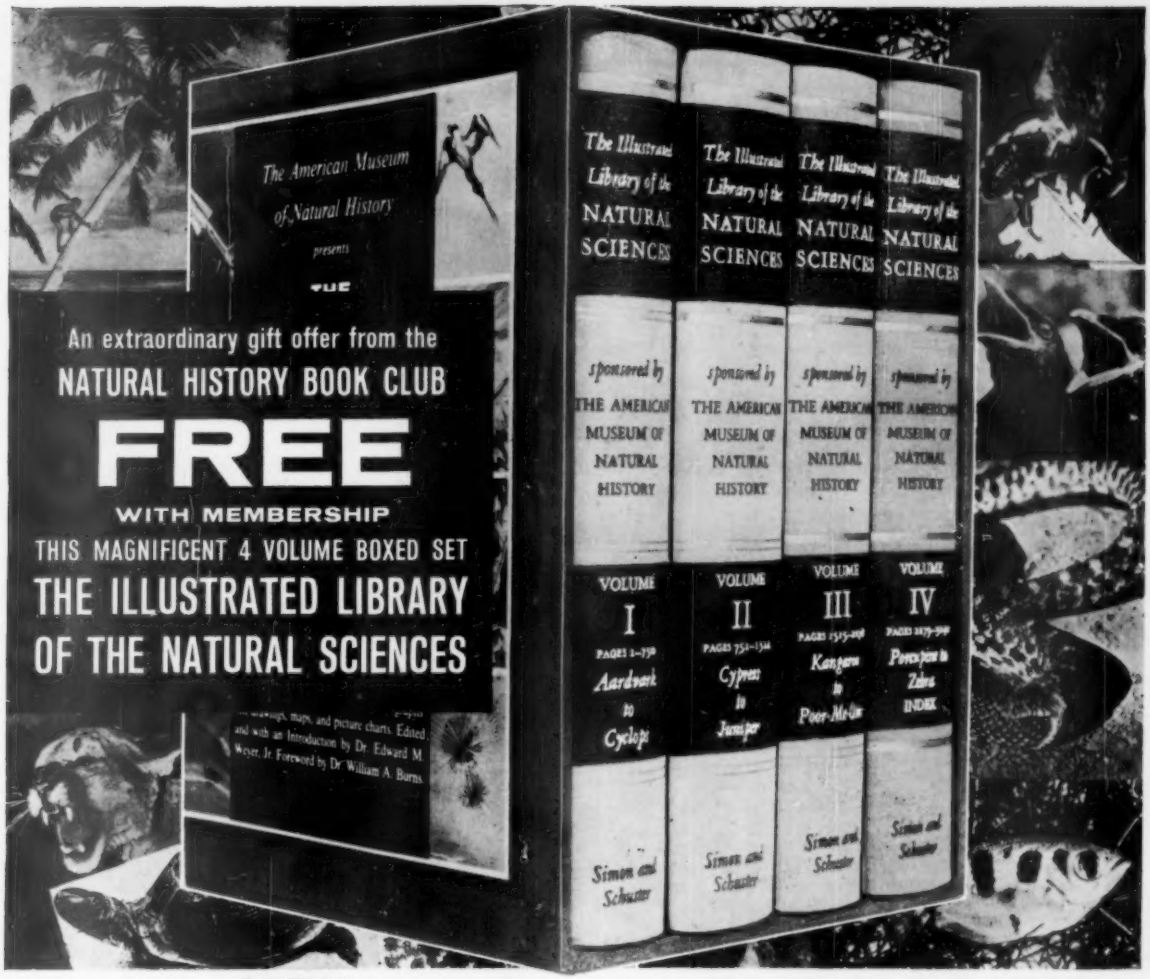
Questions

BACTERIOLOGY—What new development has been achieved in the study of leprosy? p. 328.

ENGINEERING—What are some of the characteristics of the fabric that a nuclear-powered blimp would be made of? p. 322.

PHYSICS—What is a possible future use for electric shock tubes? p. 323.

Photographs: Cover and pp. 324, 325, 326, Science Service; p. 323, Avco-Everett Research Laboratory; p. 336, Eastman Chemical Products.



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TRANSPARENT-TAPE DISPENSER, designed especially for home use, is made of sculpture-styled plastic. It is weighted so that it will not tilt or slide when tape is dispensed from it. The dispensers accommodate two tape widths and come in green, pink, yellow or coral.

Science News Letter, May 23, 1959

STEERING WHEELS for pleasure boats are made of gold- and silver-flecked plastic made in a variety of colors. Molded hand grips and spokes are in white plastic. The wheels come alone or with chrome-finished universal mounting brackets, permitting installation at different angles.

Science News Letter, May 23, 1959

SPACE TRAVELER TABLE GAME for four players consists of a playing board with planetary orbits, a deck of 45 space traveler tickets, 9 space ships, 3 planets, 4 "station stop" schedules and rules. The object is to be first to reach Mars. Winning is said to depend on foresight and planning as well as chance.

Science News Letter, May 23, 1959

GREAT CIRCLE MAP INDICATOR, shown in the photograph, has a rear-projected wedge of light that shows the amateur radio operator when his antenna is in the proper direction. The plastic, 16-inch-diameter indicator may be hung on the

wall or mounted directly on the control table. The light wedge, ten degrees wide at the edge of the indicator, moves on the map as the antenna rotates, and shows beam direction and width.

Science News Letter, May 23, 1959

PLASTIC FLOOR COMPOUND made with epoxy resin and hardener is said to resist abrasion, chemicals and greases that ruin conventional wood, metal or concrete surfaces. The material may be broken up and patched to conform with redesigning plans without need of replacing entire sections.

Science News Letter, May 23, 1959

NURSING BOTTLE has a bottom valve that, it is claimed, will relieve the vacuum built up in the bottle by sucking action, thereby keeping the nipple from collapsing and interfering with milk intake. The bottle is made of plastic and will withstand sterilization temperatures.

Science News Letter, May 23, 1959

GARMENT-TYPE INFANT SEAT, small enough to put in a handbag, can be slipped onto a kitchen chair, making it serve the purpose of a high chair. It may be used to prop up babies from six weeks to six months in a crib, carriage or armchair. It also doubles as a substitute traveling bed.

Science News Letter, May 23, 1959

FOOD CUTTER of plastic has two replaceable steel blades, one straight and the other corrugated. A dial adjusts thickness of each slice. A wide variety of cuts is made possible by blade selection, dial setting and direction of slicing. The cutter can be used to shred cabbage; slice potatoes, beets and carrots; make cheese straws; cut corn from the cob, and ripple potatoes.

Science News Letter, May 23, 1959

Nature Ramblings

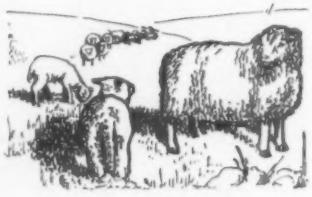
By HORACE LOFTIN

IN ALL the animal kingdom, the only creatures to possess that strange structure called "hair" are the mammals. Moreover, every kind of mammal wears a coat of hair at some stage of its life history, although you may have to look at an embryo to find it. Man has a hairy embryonic coat, as have mammals such as the whales and elephants which are practically devoid of hair in the adult stage.

Hair is derived from cells in the skin. The root is alive and capable of producing new hair cells, while the external hair is dead. Each hair shaft has three layers: a thick inner pith; a middle group of transparent cells which contain the color pigments; and an outer layer of overlapping scales. These scales may form in different patterns. Experts can often identify a mammal as to species by an examination of the hair structure alone.

The body hairs are of two general kinds,

. . . Have You Any Wool?



the guard hairs and the under hairs. The guard hairs are usually longer and coarser, furnishing protection. These include various kinds of spines and quills, such as the porcupine uses so well; and the coarse bristles of the usual mammalian coat. These bristles are removed in the preparation of pelts for use as fur garments.

There are three general types of under hair. Most typical is the soft, short coat of fur. Another is wool, distinguished by its length and curliness. The fine down of fetal or very young mammals is known as "vellum."

Other specialized hairs include "cat whiskers," or vibrissae, found in many mammals. These are sensory in nature. The horns of rhinoceroses are composed of a compact mass of hair, hardened by a material called keratin.

The hair of most mammals ceases growth when it reaches a certain length, such as the body hair of humans or the fur of bears; this is called definitive hair. Some hair, however, grows continuously; this is called angora hair.

Hair is useful in a number of ways to the mammals, but most important probably is its function in heat insulation. Only the birds (with their coats of feathers) and the mammals (with their coats of hair) are able to regulate their body temperatures—an ability which has helped them maintain their places at the top of the animal kingdom.

Science News Letter, May 23, 1959